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The FLORA HAWAIIENSIS or NEW ILLUSTRATED FLORA OF THE HAWAIIAN ISLANDS

By

OTTO DEGENER, B.S., M.S.
Botanist, University of Hawaii, 1925-27.
Naturalist, Hawaii National Park, 1929.

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The Flora Hawaiiensis
or
New Illustrated Flora of the Hawaiian Islands

By

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Author, "Plants of Hawaii National Park," 1930.

It is the aim of the completed *Flora Hawaiiensis* or *New Illustrated Flora of the Hawaiian Islands* to contain descriptions and illustrations of all native and introduced ferns and flowering plants growing in the Hawaiian Islands. The two factors which very seriously handicap this aim are (1) the almost continuous introduction of exotic plants to the Islands, and (2) the present lack of knowledge concerning native Hawaiian plants.

Due to the agency of man, hundreds of different species of plants are brought yearly to the Islands. They are purposely introduced by the various experiment stations and other reliable agencies for economic reasons, and to a lesser extent by individuals who merely wish to cultivate a certain kind of plant advertised in a seed catalogue or a plant which they had admired during their youth in the "home country." These plants are also accidentally introduced in packing material, in cattle feed, etc. Many of these introduced plants, both beneficial and harmful, are apt to find conditions here favorable for growth, and become naturalized. Such plants, if persistent, surely deserve record in a local Flora, but to include them therein as they are introduced from time to time is impossible if the format of the book is of the usual kind.

Although the native Hawaiian plants have been collected and studied ever since the discovery of the Islands by Captain Cook, our knowledge of ferns and flowering plants growing locally is still very meager. We can arrive at an indication of this by comparing our present knowledge of certain genera or groups of plants which have been more or less completely monographed with the corresponding groups as listed in Hillebrand's "Flora of the Hawaiian Islands," published in 1888. Thus, considering the groups *Argyroxiphium, Bidens, Cuscuta, Dianella, Doodya, Exocarpos, Lobeliaceae, Peperomia, Santalum, Scaevola* and *Vaccinium*, we find that Hillebrand ascribed about 110 kinds of plants to them, while various monographers and authorities have raised the total to at least 325 at the present time—an increase of over 200%. As Hillebrand listed a total of 999 kinds in his completed Flora, it is reasonable to assume that if all his genera were to be

revised similarly to the above, the new Flora would contain roughly at least 3,000 plants. The writer (after specializing on the study of Hawaiian plants for ten years) is convinced that twice that figure will prove to be nearer the truth. These plants, yet to be discovered, must be included in a Flora of the Hawaiian Islands to make it complete and up to date.

The fact that probably only about one-third to one-half the native vegetation is yet known must be attributed to geographic as well as to human causes. These islands, isolated for ages by miles of ocean, have slowly developed a remarkable native flora, approximately 85% of the component species not being represented elsewhere. Even if all these different Hawaiian plants had been collected and made available for botanists, their complete study would constitute a herculean task. To complicate matters, we find that many of these plants grow only on a single mountain slope, definite ridge or precipitous *pali;* or in a single valley or park-like *kipuka.* When we glance at a map of the Islands and note the vast areas on Kauai, Maui, Hawaii, and even on Oahu and Molokai not yet visited by botanists, the reader's opinion regarding the statement that thousands of unrecorded plants still remain to be discovered may well change from surprise or doubt to conviction.

The human reason for the very incomplete knowledge regarding Hawaiian plants is due largely to the unusually rapid "turnover" of the scientists who come to the Islands. Many, during the last few decades, have come here eager to solve biologic problems. But by the time they have become familiar with local conditions and are at the peak of productivity, their enthusiasm has waned and, disillusioned, they either migrate, enter business or retire. Inexperienced neophytes then come to take their places, and scientific productivity thus suffers. Due to the close coöperation of a large group of local and mainland lovers of science, the cause of this trouble at last has been definitely established. Following their recommendation, these well-known conditions will be changed for the better, and next year a renaissance in Hawaiian science will begin.

Because of the constant influx of foreign plants and of the discovery for many centuries to come of undescribed native ones, it seems very impracticable to write a Hawaiian Flora in regular book form. This has been attempted several times in the past with only moderate success because each of these books, shortly after its completion, has become incomplete or actually obsolete, due to the omission of plants deserving of record. This is not the fault of the authors and casts no reflection upon their ability. It is due to the peculiar circumstances to which the Islands are subject.

To offset the disadvantage of producing a work which is rather ephemeral and cannot grow in proportion to our ever-increasing knowledge of the introduced and foreign vegetation, the writer some years ago devised a simple method now used in his *Flora Hawaiiensis.* By this method, as the following illustrated explanation shows, his Flora can never become obsolete, but will always remain the *New Illustrated Flora of the Hawaiian Islands.*

The *Flora Hawaiiensis* will be published at irregular intervals in fascicles, termed Centuries, each containing approximately 100 plant descriptions and 100 full-page illustrations. In structure it will consist of separate pages, each perforated in such a way as to enable convenient binding in a simple folder. By this means each sheet will be a unit which may be readily inserted in the binder in the proper place. Or, if the description should become obsolete, the sheet may be removed and discarded without in any way interfering with the remaining sheets, and displaced by a revised one.

The major part of the *Flora Hawaiiensis* will consist of three kinds of sheets. One will give a family description on one

side and on the reverse a synoptic key to the genera, found in the Islands, belonging to that family. The other type will contain a generic description on one side and on the reverse a key to the species, found in the Islands, belonging to that genus. If the genus is monospecific or if the Islands harbor only one of its species, then the reverse page will remain blank. The third type of sheet, and the most numerous, will contain a specific description on one side and on the reverse a carefully executed illustration of the plant in question. The following pages are examples.

As additional descriptions and illustrations are completed for the Flora from time to time, they must be bound with the previous contributions in correct taxonomic sequence and not according to their chronologic order of publication. This can be done readily because each family of Vascular Plants is given a number according to its position in the Englerian System of Classification. Thus all descriptions coming under the category of a definite family would be assembled. Following each family description, the included genera are to be arranged in alphabetical order. After each genus, the species then are to be arranged likewise in alphabetical order. Hence the pagination of the work instead of being in numerals alone will be in numerals and letters.

In addition to the descriptive part of the work, the completed *Flora Hawaiiensis* will include keys for the determination of families, a general description of the Islands, maps, accounts of the origin and relationship of the Hawaiian flora, historical sketch of Hawaiian botany, a glossary of botanical terms, an index, etc.

Family: 52

LEMNACEAE

DUCKWEED FAMILY

Minute perennial plants floating free at the surface of the water, devoid of distinct stem or leaves, the plant body consisting of a disk-shaped elongated or irregular thallus which in some species bears several, in others one or even no rootlets. The inflorescence consists of one or a few naked monoecious flowers borne on a slight lateral prominence on the edge or upper surface of the plant. A flower usually consists of a single stamen or of a single flask-shaped pistil that finally develops into a 1- to 7-seeded utricle. The plants flower and fruit rarely, the fruit in many species even being unknown. The common method of propagation is by the growth of a new thallus from a cleft in the edge or base of the old one, the slender connecting stalk usually soon breaking apart. Minute resting bulbs are sometimes formed that sink in the water to remain at the bottom during unfavorable seasons. They rise and form new thalli when conditions again become favorable.

This family, which may be regarded as reduced *Araceae,* consists of 4 genera and about 30 species, many of wide distribution. It contains the simplest and the smallest of the flowering plants.

(Otto Degener, 8/10/'32)

Family: 52

LEMNACEAE

DUCKWEED FAMILY

KEY TO LOCAL GENERA:

Plant with one or more roots; plant more than 1.5 mm. long:

Thallus with about 8 prominent nerves and a cluster of several rootlets.....SPIRODELA

Thallus with about 3 obscure nerves and a single rootlet .....LEMNA

Plant without roots; plant less than 1.5 mm. long..WOLFFIA

(Otto Degener, 8/10/'32)

FLORA HAWAIIENSIS

Family : 80
Genus : Spathoglottis
Species: Plicata

ORCHIDACEAE
ORCHID FAMILY

SPATHOGLOTTIS PLICATA Blume
SPATHOGLOTTIS

Spathoglottis plicata Blume, Bijdr. 401. 1825.
Spathoglottis spicata Lindl. in Journ. Linn. Soc. 3:9. 1859.

Terrestrial orchid with conic pseudobulb covered with leaf fibers. Leaves 6-12 dm. long and 3-5 cm. wide, lanceolate, plicate; petioles 15-45 cm. long. Flowers on purplish about 2 cm. long glabrate pedicels in axil of reflexed purplish almost 2 cm. long obovate to lanceolate cuspidate bracts to form a many-flowered 3-12 dm. high glabrous scape. Sepals ovate-oblong, 18 mm. long and 9 mm. wide, acute at apex, spreading, magenta. Petals slightly larger than sepals, 11 mm. wide. Lip with oblong truncate magenta lateral lobes 7 mm. long and 4 mm. wide and with deltoid 16 mm. long reniform emarginate central lobe having narrow base and 2 bright yellow 4 mm. wide calluses. Ovary about 1 cm. long, purplish, longitudinally grooved. Column magenta, 13 mm. long and 5 mm. wide. Capsule oblong, pendulous, 3.5 cm. or more long.

Type Locality: Malaya.

Local Range: A few plants were purposely introduced from the Philippines for curiosity and ornament, and grown in the tree nursery of the Hawaiian Sugar Planters' Association in Vineyard Street, Honolulu. These soon flowered, fruited, and shed their innumerable minute seeds among the nursery stock propagated there. When this was set out in various localities on the Island of Oahu, the obscure orchid seeds and seedlings became scattered without design. By 1930 and 1931 mature plants were found naturalized in numbers near the base of the Pig-God Trail in Punaluu Valley. A few more were found respectively near the source of Kaluanui Stream, on the northern side of Kaipapau Valley, along the Pupukea-Kahuku Trail near Pupukea, near Haleiwa, and in Makua Valley. As this orchid was not known as an escape on Oahu previous to about 1930 and has become naturalized in so many localities in so short a time, it will undoubtedly continue to spread. Let us hope that it may develop into a welcome addition to our flora and not become a pest like the tritonia and the isotoma, two other ornamental plants. It thrives in open, grassy situations, even where the soil is poor and dry. It blooms throughout most of the year. According to L. W. Bryan, this orchid has of late years become naturalized on Hawaii near Hilo and in the Puna District.

Extra Range: Widely distributed, growing in the Philippines, Formosa, Sumatra, Java, Borneo, New Guinea, Caroline Islands and elsewhere.

(Illustrated on following page)

(Otto Degener, 7/30/'32)

NEW ILLUSTRATED FLORA OF THE HAWAIIAN ISLANDS

Family : 80
Genus : Spathoglottis
Species: Plicata

ORCHIDACEAE
ORCHID FAMILY

SPATHOGLOTTIS PLICATA Blume

(Original)

(Otto Degener, 7/30/'32)

(Described on preceding page)

Family: 169b
Genus: Biancaea

LEGUMINOSAE
PEA FAMILY

BIANCAEA Todaro, Nuov. Gen. 21. 1858-61.

Prickly woody vines or rarely small trees. Leaves evenly bipinnate. Flowers yellow to yellowish, not papilionaceous, deflexed, racemose. Calyx tube broadly urceolate, with 5 petaloid deciduous lobes. Petals 5, subequal, short-clawed, longer than calyx lobes. Stamens 10; filaments densely woolly below, somewhat longer than petals; anthers equal, longitudinally dehiscent. Ovary sessile; style slender; stigma subtruncate. Pods compressed, unarmed, oblong to falcate, few-seeded, indehiscent or tardily dehiscent. Seeds compressed, often oblong, with thick cotyledons.

Named in honor of Giuseppe Bianca, a student of Sicilian plants in the 19th Century.

Type Species: *Caesalpinia sepiaria* Roxb.

A few species, all native to the tropics of the Old World. They differ from species of *Guilandina* chiefly in the character of the pod and seed.

Family: 169b
Genus: Biancaea

LEGUMINOSAE
PEA FAMILY

KEY TO LOCAL SPECIES OF BIANCAEA:

Small erect tree, slightly prickly; pod 3-4 cm. wide..**B. sappan**

Straggling shrub, very prickly; pod less than 3 cm. wide.....**B. sepiaria**

(Otto Degener, 7/15/'32)

FLORA HAWAIIENSIS

Family: 169b
Genus: Biancaea
Species: Sepiaria

LEGUMINOSAE

PEA FAMILY

BIANCAEA SEPIARIA (Roxb.) Todaro
MYSORE THORN (WAIT-A-BIT)

Caesalpinia sepiaria Roxb. Hort. Beng. 32. 1814. nom. nud.
Caesalpinia sepiaria Roxb. Fl. Ind. 2. 2:360. 1832.
Not *Caesalpinia sepiaria* Wall. Cat. n. 5834. 1832.
Biancaea scandens Todaro, Nuov. Gen. 22. 1858-61.
Biancaea sepiaria Todaro, Hort. Bot. Panorm. 3. 1876.

A much-branched, quick-growing, very prickly straggling shrub, 3 meters high or less and often covering large areas, with old branches having dark glabrous smooth bark and with young greenish twigs puberulent and beset with almost straight prickles about 5 mm. long. Leaves 1-5 dm. long, of 4-10 pairs of pinnae; petiole thick, tapering into rachis which is very slender toward apex, like rachis puberulent and on upper surface often red while on lower surface armed with subopposite backward-curving sharp prickles commonly 3-4 cm. long; pinnae short-petioluled, paired at right angles to rachis which is armed on upper surface with single forward-curving prickle between each pair of pinnae; secondary rachis on upper surface unarmed but on lower surface obscurely armed with single recurved prickle between each pair of ultimate leaflets; ultimate leaflets 7-12 pairs, thin, oblong to obovate-oblong, 8-20 mm. long, rounded to retuse at apex, obliquely obtuse at base, on petiolule 1 mm. long or less, somewhat dark-green above and pale beneath, obscurely silky-pubescent to glabrate on both sides; stipules herbaceous, half-sagittate, about 1 cm. long and 6 mm. wide, acuminate and spinescent at apex, early deciduous. Flowers light-yellow, deflexed at anthesis, on 1.5-3 cm. long pedicels jointed toward top and at base, usually many to form a puberulent axillary or terminal raceme about 25 cm. long. Calyx tube 2 mm. long, 3 mm. wide, 6 mm. high, green, obcompressed; lobes subequal, about 7 mm. long and 3 mm. wide, glabrous within and puberulent without, greenish-yellow at base and light-yellow toward apex, becoming reflexed, the lowest lobe differing from the others in being broadly keeled and longer. Petals light yellow, glabrous; upper lobe reflexed, pale, obovate-spatulate, 9 mm. long and 4 mm. wide; lateral pair obliquely orbicular, 9 mm. in diameter; lower pair obliquely obovate, 12 mm. long and 8 mm. wide. Stamens 12-14 mm. long; filaments pale; anthers 2 mm. long, brown; pollen orange. Ovary 5 mm. long, pubescent; style 10 mm. long, pubescent except toward apex; stigma glabrous, green. Pod obliquely oblong, glabrous, horizontal, leathery, first dehiscent by upper valve, 5-9 cm. long and 2-2.5 cm. wide, abruptly long-beaked, 4- to 8-seeded. Seeds oblong-ovoid, smooth, black with yellowish-brown markings, 8 mm. long and 5-6 mm. thick.

Type Locality: Bengal, India.

Local Range: A naturalized weed which Hillebrand in 1888 recorded from the Islands as being "planted in hedges," while Rock in 1920 stated that it "is rather common, especially on the Island of Oahu." Between 1922 and 1932 the present writer has found this species only near Waiahole, in Makiki and Palolo Valleys, and along Kaukonahua Gulch, Oahu. In the latter locality it is extremely common. Although this plant is very ornamental when flowering, it should be eradicated because of its nasty, recurved thorns. It is apt to to become troublesome in the drier lowlands and pastures. It seems to have a short flowering season, this depending somewhat on the rainfall. Plants were observed flowering in profusion in January. In the middle of February not a single flower could be seen, but only ripening and ripe pods.

Extra Range: Native to the East Indies; long naturalized in many tropical countries where it is occasionally planted as a hedge.

(Illustrated on following page)

(Otto Degener, 7/15/'32)

NEW ILLUSTRATED FLORA OF THE HAWAIIAN ISLANDS

Family : 169b
Genus : Biancaea
Species: Sepiaria

LEGUMINOSAE
PEA FAMILY

BIANCAEA SEPIARIA (Roxb.) Todaro

(Original)

© Otto Degener, 7/15/'32

(Described on preceding page)

FLORA HAWAIIENSIS

Family : 182
Genus : Swietenia
Species: Mahagoni

MELIACEAE
MAHOGANY FAMILY

SWIETENIA MAHAGONI Jacq.
WEST-INDIAN MAHOGANY

Swietenia mahagoni Jacq. Enum. 20. 1760.
Swietenia macrophylla Neal & Metzger, In Hon. Gard. 175. 1928.
Not *Swietenia macrophylla* King, in Hook. Icon. pl. 16. t. 1550. 1886.

A large to medium size tree having compact ovoid crown and developing with age buttresses at base, with reddish scaly bark and many angular smooth branches. Leaves deciduous before flowering time, leathery, shiny, glabrous and dark green above, glabrous to sparingly pubescent and lighter green below, pinnate, 10-15 cm. or more long of which the slender petiole is about 4 cm. long and enlarged toward base; leaflets 6-10, paired excepting the lowest which are sometimes subopposite, ovate-lanceolate, 4-8 cm. long, 1.5-3 cm. wide, inequilateral so that inner side is about half the width of outer side, at apex acuminate to finely caudate, at base oblique so that upper half of rounded blade is attached to 2-5 mm. long terete petiolule 1-4 mm. lower than is remaining part of blade. Flowers on usually 2 mm. long pedicels borne in supra-axillary slender panicles 6-15 cm. long. Petals pale greenish-yellow, obovate-spatulate, 3-4 mm. long, retuse, obscurely fimbrillate. Stamen tube glabrous, 3 mm. high, greenish-yellow; anthers brownish. Ovary ovoid; nectaries conspicuously orange; style erect; stigma 5-rayed and thick-peltate. Fruits an ovoid to pear-shaped grayish-brown capsule 6-10 cm. long. Seeds numerous, 5-6 cm. long and about 1.5 cm. wide, very light, corky below and thin above, light brown, with 15 mm. long and 8 mm. wide embryo.

Type Locality: None given; apparently the Bahama Islands.

Local Range: The true mahogany of commerce, one of the most valuable woods used for fine furniture and cabinet work. Around 1917 a row of these trees was set out in Kalakaua Ave., Honolulu, while before that time only a few trees were to be found scattered in gardens here and there in the Territory.

Extra Range: Native to tropical America.

(Illustrated on following page)

(Otto Degener, 9/10/'32)

NEW ILLUSTRATED FLORA OF THE HAWAIIAN ISLANDS

Family : 182
Genus : Swietenia
Species: Mahagoni

MELIACEAE
MAHOGANY FAMILY

SWIETENIA MAHAGONI Jacq.
(Original)
(Described on preceding page)

© Otto Degener, 9/10/'32

FLORA HAWAIIENSIS

Family : 221
Genus : Hibiscadelphus
Species: Hualalaiensis

MALVACEAE
MALLOW FAMILY

HIBISCADELPHUS HUALALAIENSIS Rock
HUALALAI HIBISCADELPHUS; HAU KUAHIWI

Hibiscadelphus hualalaiensis Rock in Bull. Haw. Board Agric. & For. 1:14. 1911.

Tree 5-7 meters high with erect 3 dm. thick gray trunk and with terete branches bearing prominent leaf scars. Leaves orbicular to undulately bluntly 3-pointed, 1-2 dm. wide, cordate to somewhat reniform at base, bluntly acute at apex, with subentire margin, with about 6 main nerves which branch several times, above with scattered yellowish stellate hair especially on the nerves, below tomentulose, with 8-16 cm. long petioles; young leaves hirtellous. Flowers single or a pair of unequal ages on 1.5-2 cm. long stellate-pubescent pedicels side by side in axil of same leaf, 2.5-3 cm. long, opening only slightly. Involucral bracts usually 5, subequal, tooth-like, 1-2 mm. long. Calyx irregularly 3- to 6-lobed, the acute lobes of unequal size with some only 2 mm. long and others up to 15 mm. long, yellowish-gray, scurfy-hirtellous, marcescent and breaking away irregularly due to swelling of capsule. Corolla grayish greenish-yellow without and red-tinged within, evenly ciliate, hirsute excepting on inner side near base, with especially the lower 2 petals recurved at apex: lower 2 petals slightly obliquely oblong, 35 mm. long and 13 mm. wide, about 10-nerved, adnate to torus at one side of truncate base, long-cuspidate at apex; lateral 2 petals falcate, 40 mm. long and 13 mm. wide, about 10-nerved, truncate at base, long-cuspidate at apex; upper petal similar but slightly longer. Staminal column about 3.5 cm. long, glabrous, exserted one-third its length, with apex acutely 5-dentate with 1 mm. long teeth, bearing numerous filaments toward upper end; anthers semicircularly curved, about 1 mm. in diameter. Ovary conical, densely silky-tomentose, 5-celled, with 3 ovules in each cell; ovules ovate, the upper ascending and the lower horizontal; style branches 5, erect, reddish, 5 mm. long, hirsute with forward-pointing whitish hair; stigmas thickened. Capsule narrow-ovoid, woody, longitudinally 5-grooved into septa alternating with slight longitudinal depression, 2 cm. long and 1.5 cm. wide, flattened toward top, covered with yellowish gray scurfy-stellate hair and bearing remains of woody calyx at base. Seeds reniform, covered with a dense long yellowish white pubescence.

Type Locality: *In insula Hawaii: J. F. Rock leg. in declivibus montis Hualalai occidentum versus Jun. a. 1909.* . . . "at an elevation of 2700 feet on the lava fields of Puuwaawaa and in the forest of Waihou where a number of trees is to be found."

Local Range: Less than a score of these remarkable treees were known to be in existence. They are endemic to the lava fields of Hualalai and the forest of Waihou, North Kona, Hawaii. These plants have been visited so rarely that the exact season for their flowering and fruiting cannot be given. They have been found in flower as early as March and as late as July, and in fruit in June and July. A few years ago L. W. Bryan, Assistant Forester of the Territory, discovered about 200 of these trees in the Hualalai region. He and his associates collected seed from these wild plants and raised several hundred seedlings for distribution.

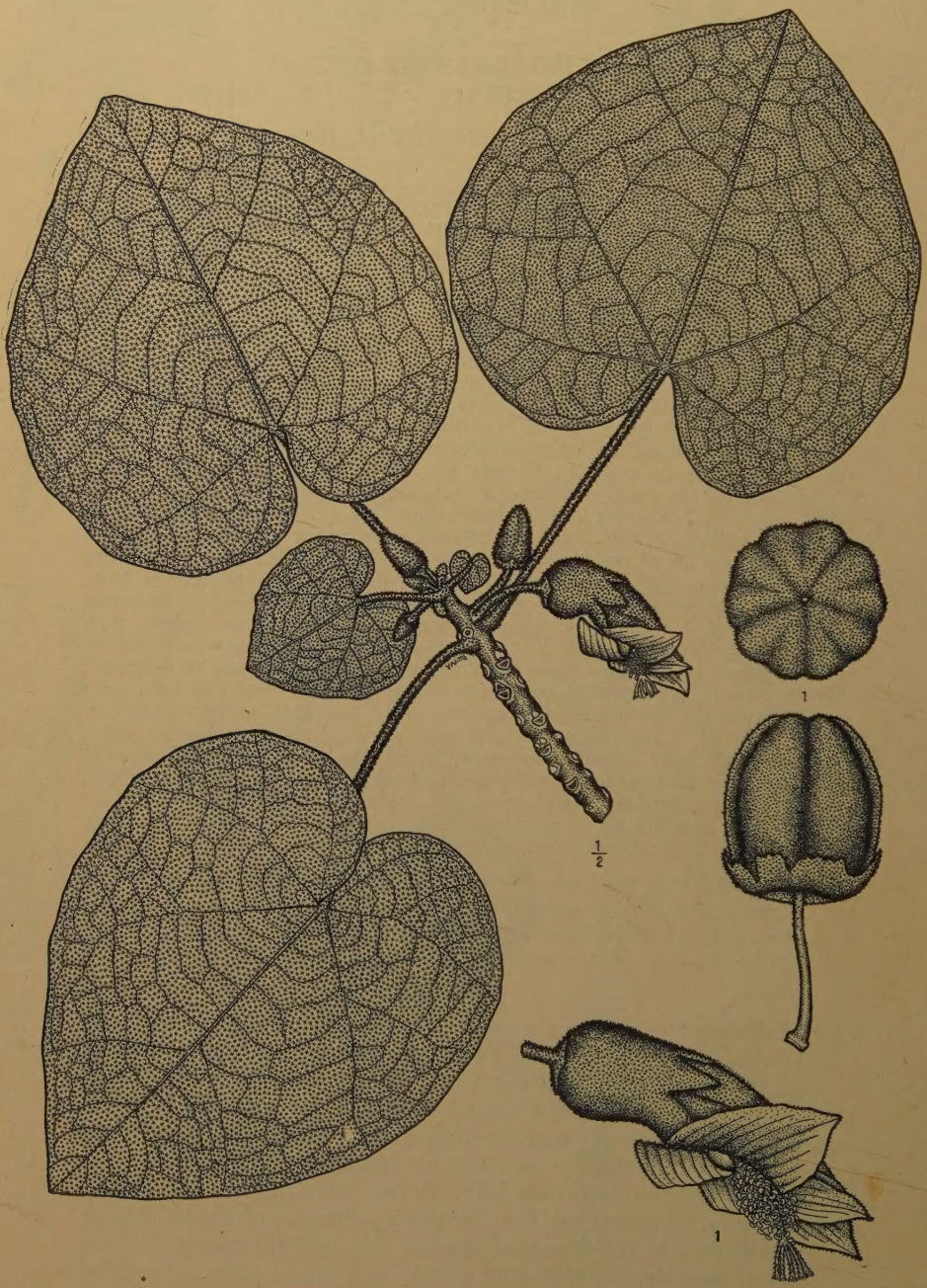
(Illustrated on following page)

(Otto Degener, 9/10/'32)

NEW ILLUSTRATED FLORA OF THE HAWAIIAN ISLANDS

Family : 221
Genus : Hibiscadelphus
Species: Hualalaiensis

MALVACEAE
MALLOW FAMILY



HIBISCADELPHUS HUALALAIENSIS Rock

(Original)

© Otto Degener, 9/10/'32

(Described on preceding page)

(Puuwaawaa, Hawaii)